

IN THE CLAIMS:

1. (Currently Amended) A through-in grinding method for centerless-grinding a cylindrical [[a]] work being machined having a conical surface at an end thereof, [[wherein]] comprising:

supporting said work being machined [[is supported]] by a blade and a regulating wheel to which a feed angle is imparted;

performing through-feed grinding [[is performed]], using a grinding wheel having cylindrical and conical surfaces, and causing the cylindrical surface of [[a]] the grinding wheel [having cylindrical and conical surfaces] to contact the cylindrical surface of said work being machined while causing said grinding wheel to revolve; and

stopping through-feed grinding when the conical surface of said work being machined that was moved in the axial direction by said through-feed grinding makes contact with the conical surface of said grinding wheel, and grinding the conical and cylindrical surfaces of said work being machined in a condition closely approximating in-feed grinding,

wherein, when said work being machined has been ground in a condition closely approximating in-feed grinding after being subjected to through-feed grinding, and if it is judged that said work being machined has been ground and finished to prescribed dimensions, said regulating wheel is retracted in a direction that separates same from said blade; and, by causing said work being machined to pass between said regulating wheel and said blade and drop down, the quasi in-feed grinding is terminated, and said work being machined is unloaded.

2. (Currently Amended) A through-in grinding method for centerless-grinding [[the]] a cylindrical surface and one end surface of a work being machined having a cylindrical surface and an end surface, [[wherein]] comprising:

supporting said work being machined [[is supported]] by a blade and a regulating wheel to which a feed angle is imparted;

performing through-feed grinding [[is performed]], using a grinding wheel which has a large-diameter portion, a small-diameter portion, and a step surface, and causing [[a]] the small-diameter portion of [[a]] the grinding wheel [which has a large-diameter portion, a

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small-diameter portion, and a step surface] to contact the cylindrical surface of said work being machined while causing said grinding wheel to revolve; and

stopping the through-feed grinding when the end surface of said work being machined, which [[that]] was moved in the axial direction by said through-feed grinding, makes contact with the step surface of said grinding wheel, and grinding the cylindrical and end surfaces of said work being machined in a condition closely approximating in-feed grinding,

wherein, when said work being machined has been ground in a condition closely approximating in-feed grinding after being subjected to through-feed grinding, and if it is judged that said work being machined has been ground and finished to prescribed dimensions, said regulating wheel is retracted in a direction that separates same from said blade; and, by causing said work being machined to pass between said regulating wheel and said blade and drop down, the quasi in-feed grinding is terminated, and said work being machined is unloaded.

3. (Currently Amended) A through-in grinding method for centerless-grinding a work being machined having a cylindrical surface being machined, having a conical surface being machined [[in]] at one end portion, and having a portion having a larger diameter than said cylindrical surface being machined near [[the]] another other end portion, [[wherein]] comprising:

supporting said cylindrical surface [[being machined]] of said work being machined [[is supported]] by a blade and a regulating wheel to which a feed angle is imparted;

performing through-feed grinding [[is performed]], causing the cylindrical surface of a grinding wheel having cylindrical and conical surfaces to contact said cylindrical surface [[being machined]] of said work being machined while causing said grinding wheel to revolve; and

causing the step surface of [[large-diameter]] the larger-diameter portion of said work being machined to contact the end surface of said grinding wheel, and stopping through-feed grinding at approximately same time [[with that]] when the conical surface of said work being machined that was moved in the axial direction by said through-feed grinding makes contact with the conical surface of said grinding wheel,

and grinding the conical surface and cylindrical surface [[being machined]], and the step surface of the [[large-diameter]] larger-diameter portion[[,]] of said work being machined, in a condition closely approximating in-feed grinding; or

causing the conical surface of said work being machined to contact the conical surface of said grinding wheel, and stopping through-feed grinding before the step surface [[in large-diameter]] on the larger-diameter portion of said work being machined that was moved in the axial direction by said through-feed grinding makes contact with the end surface of said grinding wheel, and grinding the conical surface and cylindrical surface [[being machined]] of said work being machined, in a condition closely approximating in-feed grinding,

wherein, when said work being machined has been ground in a condition closely approximating in-feed grinding after being subjected to through-feed grinding, and if it is judged that said work being machined has been ground and finished to prescribed dimensions, said regulating wheel is retracted in a direction that separates same from said blade; and, by causing said work being machined to pass between said regulating wheel and said blade and drop down, the quasi in-feed grinding is terminated, and said work being machined is unloaded.

4. (Currently Amended) A through-in grinding method for centerless-grinding a work being machined having a cylindrical surface [[being machined]], having one end surface [[of which is a surface]] being machined, and having a portion [[having]] with a larger diameter than said cylindrical surface [[being machined,]] near [[the other]] another end portion being machine, [[wherein]] comprising:

supporting said cylindrical surface [[being machined]] of said work being machined [[is supported]] by a blade and a regulating wheel to which a feed angle is imparted;

performing through-feed grinding [[is performed]], using a grinding wheel having a large-diameter portion, a small-diameter portion, and a step surface, and causing [[a]] the small-diameter portion of a grinding wheel[, which has a large-diameter portion, a small-diameter portion, and a step surface,] to contact the cylindrical surface [[being machined]] of said work being machined while causing said grinding wheel to revolve; and

causing the step surface of the large-diameter portion of said work being machined to contact the end surface of said grinding wheel, and stopping through-feed grinding at

approximately same time [[with that]] when the end surface of said work being machined that was moved in the axial direction by said through-feed grinding makes contact with the step surface of said grinding wheel, and grinding the end surface, the cylindrical surface [[being machined]], and the step surface of the large-diameter portion[[,]] of said work being machined, in a condition closely approximating in-feed grinding; or

causing the end surface of said work being machined to contact the step surface of said grinding wheel, and stopping through-feed grinding before the step surface in the large-diameter portion of said work being machined that was through-fed in the axial direction by said through-feed grinding makes contact with the end surface of said grinding wheel, and grinding the end surface and cylindrical surface [[being machined]] of said work being machined, in a condition closely approximating in-feed grinding,

wherein, when said work being machined has been ground in a condition closely approximating in-feed grinding after being subjected to through-feed grinding, and if it is judged that said work being machined has been ground and finished to prescribed dimensions, said regulating wheel is retracted in a direction that separates same from said blade; and, by causing said work being machined to pass between said regulating wheel and said blade and drop down, the quasi in-feed grinding is terminated, and said work being machined is unloaded.

5. (Currently Amended) A through-in grinding method for centerless-grinding a work being machined [[comprising]] having a weak conical surface approximating a cylindrical surface, which has a relatively small apex angle, and a strong conical surface, which has a relatively large apex angle, formed near [[the]] an end on the small-diameter side of said weak conical surface, [[wherein]] comprising:

supporting said work being machined [[is supported]] by a blade and a regulating wheel to which a feed angle is imparted;

performing through-feed grinding [[is performed]], while causing a grinding wheel having a weak conical surface of small apex angle, corresponding to said weak conical surface of said work being machined, and a strong conical surface of large apex angle, corresponding to said strong conical surface of said work being machined, to revolve, causing

said weak conical surface of said grinding wheel to contact said weak conical surface of said work being machined; and

stopping through-feed grinding when said strong conical surface of said work being machined that was moved in the axial direction by said through-feed grinding makes contact with said strong conical surface of said grinding wheel, and grinding said strong conical surface and said weak conical surface of said work being machined in a condition closely approximating in-feed grinding.

6. (Currently Amended) The through-in grinding method according to any one of claims 1 to [[5]] 4, wherein, when said work being machined is subjected to through-feed grinding and through-fed in the axial direction, a stopper is provided beforehand, movement of said work being machined in through-feed direction is stopped by causing said work being machined to abut against said stopper, through-feed grinding is thereby stopped, and a quasi in-feed grinding condition is generated.

7. (Currently Amended) The through-in grinding method according to [any one of claims 1 to 6] claim 5, wherein[[[:]]], when said work being machined has been ground in a condition closely approximating in-feed grinding after being subjected to through-feed grinding, and if it is judged that said work being machined has been ground and finished to prescribed dimensions, said regulating wheel is retracted in a direction that separates same from said blade; and, by causing said work being machined to pass between said regulating wheel and said blade and drop down, the quasi in-feed grinding is terminated, and said work being machined is unloaded.

8. (Currently Amended) A through-in grinding apparatus comprising:  
a regulating wheel supported [[so]] such that a feed angle can be imparted thereto;  
a grinding wheel having a cylindrical surface and a conical surface formed therein;  
a blade for supporting a work being machined in cooperation with said regulating wheel;

stopping means for limiting movement, in the through-feed direction, of said work being machined [[that is]] and supported by said regulating wheel and said blade;

means for conveying said work being machined in the axial direction and feeding same to a position [[where same is]] supported by said regulating wheel and said blade; and

means for separating said regulating wheel from said blade and causing said work being machined to drop down by gravity and to pass between said regulating wheel and said blade, thereby unloading said work.

9. (Currently Amended) A through-in grinding apparatus comprising:  
a regulating wheel supported [[so]] such that a feed angle can be imparted thereto;  
a grinding wheel having a large-diameter portion, a small-diameter portion, and a step surface formed therein;

a blade for supporting a work being machined in cooperation with said regulating wheel;

means for feeding said work being machined in the axial direction to a position where same is supported by said regulating wheel and said blade; and

means for separating said regulating wheel from said blade and causing said work being machined to drop down by gravity and to pass between said regulating wheel and said blade, thereby unloading said work.

10. (Currently Amended) A through-in grinding apparatus comprising:  
a regulating wheel supported [[so]] such that a feed angle can be imparted thereto;  
a grinding wheel having a weak conical portion that has a small apex angle, [[which]] said weak conical portion is approximately [[is clearly]] cylindrical, and a strong conical portion that has a large apex angle;

a blade for supporting a work being machined in cooperation with said regulating wheel;

stopper means for limiting movement, in the through-feed direction, of said work being machined [[that is]] and supported by said regulating wheel and said blade;

means for feeding said work being machined in the axial direction to a position where same is supported by said regulating wheel and said blade; and

means for separating said regulating wheel from said blade and causing said work being machined to drop down by gravity and to pass between said regulating wheel and said blade, thereby unloading said work.

11. (Currently Amended) A through-in grinding apparatus comprising:
- a regulating wheel supported so that a feed angle can be imparted thereto;
  - a grinding wheel having a weak conical portion that has a small apex angle, which is nearly cylindrical, a large-diameter portion positioned adjacent to the end the large-diameter side of said weak conical portion, and a step surface between said large-diameter portion and the end on the large-diameter side of said weak conical portion;
  - a blade for supporting a work being machined in cooperation with said regulating wheel;
  - means for feeding said work being machined in the axial direction to a position where same is supported by said regulating wheel and said blade; and
  - means for separating said regulating wheel from said blade and causing said work being machined to drop down by gravity and to pass between said regulating wheel and said blade, thereby unloading said work.

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